

Application No. 10/518,197
Paper Dated: March 28, 2008
In Reply to USPTO Correspondence of September 28, 2007
Attorney Docket No. 1217-045623

REMARKS

Claims 1-7 are pending in the application. Applicants respectfully request reconsideration in light of the amendments made herein taken with the following remarks. Claim 1 has been amended by way of the current Amendment. Support for the amendments made herein can be found in Figs. 1 and 2, page 19, lines 5-10, page 20, line 20 to page 21, line 9 of the Specification and in claim 1, as filed. Applicants respectfully submit that no new matter has been added by way of the current Amendment.

Objection to the Abstract:

The Abstract has been objected to for containing legal phraseology. The Abstract has been amended to remove instances of legal terms appearing therein. Applicants respectfully request that the objection be withdrawn.

Rejections under 35 U.S.C. §102(b):

Claims 1 and 4 stand rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,265,859 to Jewett (hereinafter "Jewett").

The claimed invention relates to a silicon production reactor having a reaction vessel and heating means. The reaction vessel includes a vertically extending wall and a space surrounded by the wall, which is of slit form in cross-sectional view. The heating means is capable of heating a part of the wall's surface facing the space to a temperature of not lower than the melting point of silicon. The reactor is adapted to flow raw gas for silicon production from an upper part of the pace of the reaction vessel toward a lower part thereof.

Independent claim 1 has been amended to recite specific claim language as to "said heating means being capable of heating a part, which is 90% or less of the whole length of the vertically extending wall from the bottom thereof, of the wall's surface . . ." and "said heating means being divided into at least two sections consisting of a first heating means and a second heating means so that said heating means can control the temperature of the wall's surface facing the space in two or more divided sections consisting of upper and lower sections, or more multiple sections". Applicants respectfully submit that Jewett does not teach or suggest the subject matter of claim 1, as amended.

In depositing silicon on a wall of a reaction vessel of a silicon production reactor, silicon deposits not only on a part where heating means are provided, as shown in Diagram A provided below, but also on an upper part of the reaction vessel, as shown in Diagram B provided below, since the upper part of the reaction vessel is heated by heat transfer (page 21, line 7 of the Specification).

Diagram A

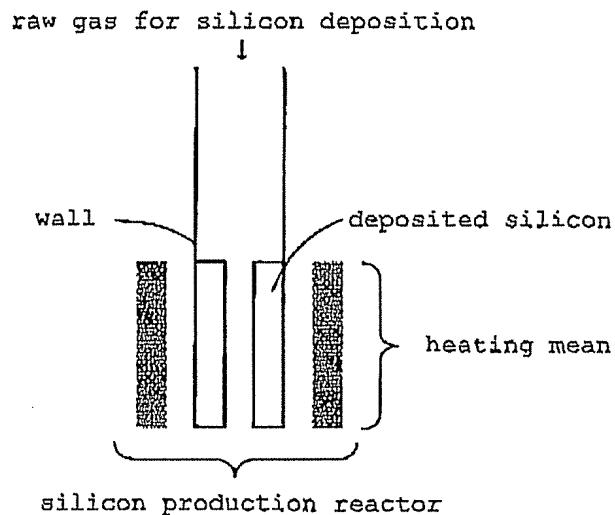
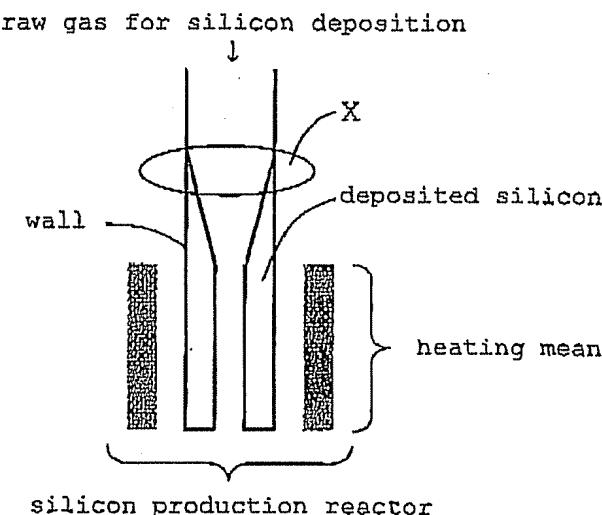


Diagram B



The silicon deposited near the part of the wall where silicon does not deposit (marked by "X" in Diagram B) cannot be melted through heating of the part of the wall where heating means are provided. Thus silicon deposits remain at this portion of the wall.

Accordingly, the reaction vessel is easily clogged by the remaining silicon when the space of the reaction vessel is narrow, such as in a reaction vessel of the claimed invention, which has a space of slit form in cross-sectional view.

In the silicon production reactor according to the claimed invention, heating means are capable of controlling temperatures of individual sections of the surface of the wall of the reactor vessel.

For example, in the case where the heating means is divided into at least two sections of a first heating means and a second heating means, according to the claimed invention and as described at page 21, lines 3-15 of the Specification, the first and second heating means can be employed as follows:

(i) first, silicon is deposited on the lower section of the reaction vessel and on an upper part of the lower section by feeding the raw gas for silicon deposition and controlling the heating means at the lower section so that the lower section has the required temperature for silicon deposition to occur, the heating means at the upper section is controlled so that the upper section has a temperature below the temperature required for silicon deposition;

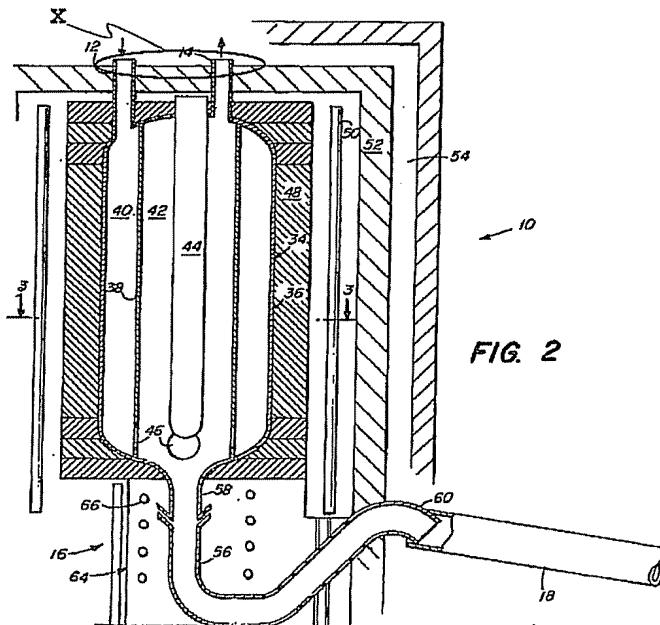
(ii) next, the deposited silicon, even the silicon deposited near the part where silicon does not deposit, is melted and falls toward a bottom of the reaction vessel by stopping the feeding of raw gas for silicon deposition and controlling the heating means at both the upper and lower sections so that both sections have a temperature not lower than that melting point of silicon; and

(iii) as a result, all the deposited silicon is removed from the reaction vessel's wall surface, which prevents clogging of the reaction vessel, even where the reaction vessel has a space of slit form in cross-sectional view.

Moreover, according to the claimed invention, the heating means is capable of heating a part, which is 90% or less of the whole length of the vertically extending wall from the bottom thereof, of the wall's surface facing the space to a temperature of not lower than the melting point of silicon. As such, it is easy to prevent silicon scale attachment to the upper part of the reaction vessel, as noted at page 19, lines 5-10 of the Specification.

Jewett, on the other hand, discloses a silicon reaction chamber (10) having a reaction vessel (34) that is heated by heating elements (50) to a temperature required for silicon deposition. In the reaction chamber (10) taught by Jewett, silicon will deposit at the inlet tube (12) and at the exhaust tube (14) for the feed gas where heating elements (50) are not provided since the tubes (12, 14) will be heated by heat transfer. As can be appreciated from Fig. 2 of Jewett, provided below, deposited silicon within the tubes (12, 14) near where silicon does not deposit (marked by "X" in Fig. 2 below) cannot be melted by the heating elements (50). The result is that inlet tube (12) and exhaust tube (14) become clogged with deposited silicon.

Fig. 2 of Jewett



Therefore, it is not possible to industrially produce silicon for prolonged periods of time by means of a silicon production reactor of the type taught by Jewett.

Further, Applicants submit that Jewett fails to teach or suggest that the heating elements (50) are capable of heating a part, which is 90% or less of the whole length of the vertically extending wall (36) from the bottom thereof, of the wall's (36) surface facing the space (40, 42) to a temperature of not lower than the melting point of silicon, as is currently claimed. Rather, Jewett teaches that the heating elements (50) heat the whole length of the vertically extending wall (36), as shown in Fig. 2 of Jewett provided above.

Nor does Jewett teach or suggest that the heating elements (50) are divided into at least two sections comprised of a first heating means and a second heating means so that the heating means can control temperature of the wall's (36) surface facing space in two or more divided sections comprised of upper and lower sections, or more multiple sections, as is currently claimed. Rather, Jewett teaches that the heating elements (50) are of a single section that heats the wall (36) as a single section. Please note Fig. 2, column 4, lines 8-11 and column 4, lines 30-44 of Jewett. Further rejection on these grounds would therefore be improper.

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Applicants submit that claim 1 is allowable for at least the foregoing reasons, as the teachings of the prior art of record are not sufficient to overcome the deficiencies in the teachings of Jewett with respect to claim 1. Applicants respectfully request that the rejection of claim 1 be withdrawn.

Claim 4 is dependent upon independent claim 1 and is allowable for at least the same reasons as claim 1. Applicants respectfully request that the rejection of claim 4 be withdrawn.

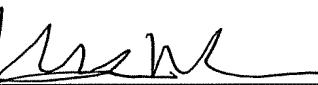
Rejections under 35 U.S.C. §103(a):

Claims 2, 3 and 5-7 stand rejected under 35 U.S.C. §103(a) as being unpatentable for obviousness over Jewett.

Claims 2, 3 and 5-7 are all dependent upon independent claim 1 and are allowable for at least the same reasons as claim 1. Applicants respectfully request that the rejection be withdrawn.

The Examiner's reconsideration and favorable action regarding claims 1-7 is respectfully requested.

Respectfully submitted,
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